plane
GRUMMAN
news

'Vital link' in new F-14 fighter undergoing tests at Pt. Mugu

The build-up goes on at Pt. Mugu.

Latest to come in as part of the F-14 effort is the AWG-9 computer subsystem, which Tom Brancati, Grumman's deputy base director at Pt. Mugu, calls "a vital link in weapons system performance."

At about the same time, another important piece of hardware came into Pt. Mugu—the MINC (Miniature Inertial Navigation Computer). Mated with a converter unit, an on-board computer takes navigational parameters and processes them to establish flight direction and control.

AWG-9, on the other hand, "enables air-battle surveillance and analysis of the entire environment in which an F-14 may be operating," says Brancati.

This new system is expected to provide the potential for more aircraft kills per strike than any existing aircraft. In addition, it will maintain a high level of reliability during the full range of carrier task force operations.

Basically, the AWG-9 system will furnish long-range aircraft target detection and tracking, with the capability of directing missile firing; this includes Sparrow and Sidewinder as well as direct firing of the 20mm cannon.

Rudy Kretschek, Engineering manager for Grumman at Pt. Mugu, indicates that integration of AWG-9 with the F-14 is this year's prime concern. "This on-the-ground SITS (System Integration Test Station) approach permits testing of all F-14 avionics **before** a test flight is ever made, so we know beforehand whether the avionics systems are in harmony; a pilot doesn't have to make a flight to prove things out."

The plan calls for an F-14 airframe (aircraft No. 4) to get to Mugu in January 1971 for installation of the avionics system. The "full up" weapons system aircraft is to be flight-tested around mid '71.

Cape walk. Jim Lovell (L), Apollo 13 commander, and Fred Haise, LM pilot, who will land on the moon's rugged Fra Mauro region in the Lunar Module this spring, walk through a segment of their planned extra-vehicular activity at Kennedy Space Center. The two astronauts were simulating deployment of an experiment package to be left on the moon. (NASA photo)

Get $20 million more for E-2C

A $20 million boost for the E-2C development program was announced recently by the Department of Defense, bringing funding for the new aircraft to $75 million.

The current expectation is that 28 planes are to be delivered to the Navy beginning in 1972. Delivery of hardware for the E-2C, successor to the E-2A and E-2B Hawkeye, is to start this year, and flight tests of the new airborne early warning aircraft are scheduled to get underway next year.

The E-2C program includes development of new avionics, systems integration, and flight testing of two production aircraft. It is being designed to meet the needs of the Fleet during the decade of the 1970's.

There's also activity on the E-2B—installation of a general purpose microelectronic computer programmer and certain reliability and maintainability changes. The Company is also modifying all support sites.

The first E-2B was delivered to the Navy in June of last year, and since that time has been at Point Mugu for more flight testing. A second E-2B was returned to Grumman for extensive electro-magnetic compatibility tests. It joined the Fleet at Naval Air Station, Norfolk, Va., last week.

Ben Franklin begins scientific dives off Florida

While Grumman looks into ecology and human resources on land and in the air, ecologists and geologists are having an opportunity to look beneath the sea off the coast of Florida. Ben Franklin, the Grumman-built submersible that successfully completed the Gulf Stream Drift last July and August, has been making dives along Florida's continental shelf for the purpose of demonstrating its versatility and usefulness in underwater study, exploration, and work.

Enthusiastic guests on a preliminary familiarization dive last December 4 and 5, and on later dives during February, were two geologists from the Woods Hole Oceanographic Institute (WHOI), Dr. Al Uchupi and Robert Ballard, and an ecologist from the Bureau of Commercial Fisheries, Dr. R. L. Wigley. They were accompanied on their first dive in February by Dr. Conrad Neumann of the National Science Foundation.

That dive proved to be especially interesting because of discovery of a limestone "pavement" or stone expanse not previously known to exist. And while drifting through a box canyon at a depth of 1500 feet, contact was lost for a while with the escort ship Privateer because of the steepness of the canyon walls. On this and subsequent dives, rocks and biological samples were picked up with a jointed, electrically driven manipulator, lent by WHOI and mounted on the bow of the submersible. One of its catches was a strange and "monstrous looking" sea urchin.

A dive at the Fort Pierce shelf to explore the Calico scallop beds has just been completed this week with guests from the Bureau of Commercial Fisheries aboard.

During March directors of prominent government agencies are being invited to be guests of Grumman.

The dives are being made to demonstrate the Ben Franklin's capabilities for underwater work, according to Walt Muench, Ben Franklin Program manager.

Members of the Grumman crews have included Don Kazimir, skipper, and Bill Rand, backup pilot; Bruce Sorensen, Fred Martin, Ray Gregory, Paul Campbell. Milt Meade went along as Grumman photographer.

Ben Franklin completed its historic drift in the Gulf Stream last August 14, a journey of 1444 nautical miles from West Palm Beach to a point in the Atlantic 300 miles south of Nova Scotia.

Vol. 29, No. 4, Bethpage, N. Y., February 27, 1970

PLAIN talk

On campus

Three Air Force captains are taking part this year, September-to-June, in the United States Air Force "Education with Industry" program. For four years Grumman has cooperated in such an arrangement and has been host to two officers who planned to make Air Force procurement and planning their specialty. For the year 1969-70, three officers are participating. They are Capt. Joseph M. Mack Jr., whose home town is Bricktown, N. J.; Capt. David N. Repak, Lowville, N. Y.; and Capt. David G. Busse of Waynesburg, Ky.

The three have had discussions and orientation with more than 50 Grumman department heads and executives since early September, and they will enter their final phase of training April 6. At this time each will begin an assignment of 10 to 13 weeks on the staff of a major weapon-system program, with the stated goal of "building a greater comprehension of the application of industrial resources to the task of developing and producing a total system."

President Lew Evans has pointed out that "our work in assisting the miltary services to develop leadership in the field of procurement planning and management is vital to the services involved, to the aerospace industry, and to the nation."

Shakedown for 'new' salts

A course on "Basic Seamanship and Small Boat Handling" is being offered by the U.S. Coast Guard Auxiliary at the Plainview Library, Old Country Road in Plainview (across from the Morton Village theater) Thursdays at 8 p.m. It started February 26 and will run for eight weeks. "It is not too late to join," according to Tillie Zipper of Plant 5 Legal, who is secretary of the Auxiliary.

Technical honor

George Lubin's contributions to plastics technology were cited by the Society of the Plastics Industry at the 25th Annual Conference of the Reinforced Plastics/Composites Division last month. The citation, a top honor known as "the Executive Committee Award for Distinguished Personal Accomplishment and Service," pleased Grumman's chief plastics consultant more than any of his previous honors. It said, in part:

"George Lubin has been an innovator, responsible for many major developments in materials and processing. He holds the first fiberglass spray patent and pioneered in filament winding." It notes that he represented the United States at the American National Exposition in Moscow in 1959, and he helped set up a cultural exchange exhibit in the USSR in 1961. He was editor of a 900-page "Handbook of Fiberglass and Advanced Filament Composites," recently published by Van Nostrand, Reinhold.

Starry eyed

The Jones Beach Stargazers have come out from behind the clouds again, and have scheduled their second session of the year for Sunday, March 15. They will meet at 7 p.m. at West End Beach 2, located west of the Coast Guard Station at Jones Beach.

Co-sponsored by the L.I. State Park Commission and Abraham & Straus, these stargazing programs are open to the public. Refractor telescopes and a 12-inch reflector telescope are set up for outdoor viewing. Special attention is given to Boy and Girl Scouts working for Astronomy merit badges.

Information on these sessions may be obtained by writing to the Special Events Department, Jones Beach State Park, Wantagh, N. Y. 11793.

Life savers

The Grumman Medical Department calls attention to two programs that might prolong some lives. "Why You Smoke" is the title of a series of five half-hour TV programs to help smokers quit. Get pencil and paper and sit before your set one of these days: Monday through Friday, March 2-6, at 7 p.m., Channel 13. Sponsored by American Cancer Society.

Women's groups, PTAs, health and church groups can request a 16mm color film on a subject that is important to women. It is called "Breast Self-Examination" and is offered by the American Cancer Society, Nassau Division. Breast cancer is the leading cause of cancer incidence and death in women today. There will be an estimated 69,000 new cases in 1970 and an estimated 30,000 deaths. Yet self-examination and consultation with a physician at the first symptom could save many of these lives. For an educational message on the subject, call the ACS "Dial for Life" service, PI 6-7598.

Talking about

Charlie Tilgner, director of Professional Activities for Grumman, has been chosen by the American Association for the Advancement of Science as a committeeman-at-large for the section committee of the Section on Engineering. He will also be a member of the AAAS Council for a two-year term, 1970 through 1971. . . . Dawson Hunter, manager of LM Spacecraft Electrical Test, addressed the Metropolitan Chapter of the Institute of Electrical and Electronics Engineers Inc. in February in Wayne, N. J. His topic: "The LM and Project Apollo." . . . The student chapter of the American Institute of Aeronautics and Astronautics, Pennsylvania State University, had as guest speaker Jim O'Neill, Advanced Ocean Systems, on February 9.

'Operation Paperwork'—it saves!

"Paper, paper everywhere
And what a pile to shrink!"

We do apologize to the memory of Samuel Taylor Coleridge for peremptorily revoking his poetic license, but it's all in a good cause: Operation Paperwork.

That operation began last May when people in the Space program took a look at the mountain of paper and said (one may guess), "We're being buried by that avalanche!"

And someone must have yelled, "Charge!"

That was a good move; the mountain was formidable. The reproduction of paperwork in the Space programs at Bethpage was running at panic pace—4,300,000 pages per month. Brownline (reproducible) drawing copies were coming at a rate of 59,000 a month and white drawing copies were churning out at a rate of 514,000 each month. Somewhat staggering, when you think about it.

So, in just three months of intensive effort—purging distribution lists, developing a system of pick-up boxes, and setting up a training program for secretaries, typists, and Engineering aides—the top of the paper mountain was blasted off, with a resultant annual saving of $326,800.

The success at Bethpage led to institution of the program at our facilities in Cape Kennedy and Houston.

It could spread to all Grumman plants. It should. How do you start? Just call Ray Pfisterer or Bill Burnett, Operational Services, Ext. 1517. They'll give you a hand.

plane GRUMMAN news

Published twice a month for the employees of Grumman Aerospace Corporation, Bethpage, N. Y. 11714, as a function of the Public Affairs Dept., Vice President J. B. Rettaliata, director.

Editor
Brian Masterson

Associate Editors
Claire Imrie
Al Wehren

Official Photographers
Presentations Services

Ads, Distribution
Dorothy Zeeb

Telephone
Plane News: 3293
Plane News from outside line:
LR 5-3293

Sorry, no ads . . .

Because this is a slimmed down version of Plane News, there wasn't any space left for the ad pages or Slipstream. Sorry. We'll try to get back on our regular format next issue.

Plan further reduction

The Company announced at the end of January that its engineering work force would be reduced, probably by about 1,200 people.

"Since that time, Grumman has made a continuing evaluation of the significance of curtailed funding by the Department of Defense and the National Aeronautics and Space Administration," says Vice President Tom Rozzi, director of Personnel Services. "We have also had a weather-eye on trends in business and finance, in Congressional attitudes, and in the general state of the economy."

That review indicates that the current Grumman work force of some 32,500 people must be trimmed by about 5,000 people during 1970—unless new or enlarged programs come through the door. It is expected that natural attrition will account for approximately 1,200 people. The reductions will affect all major operating areas in the Corporation.

CALENDAR of events

Notice of events for period March 13 - March 27 should reach Plane News by Wed., March 4.

Amateur Radio Club: Wed., March 18, 5 p.m., Plant 28 Auditorium. Bus. & prog. meeting. Spkr., Norm Sternberg. Emmett Goodman, Ext. 87121.

Amer. Inst. of Aeronautics & Astronautics: Wed., March 18, 6 p.m. Four Seasons C.C., Woodbury. Dinner. Spkr., Lt. Gen. Austin W. Betts, Chief of R & D, U.S. Army. Mrs. J. Smart, 595-3086.

Amer. Inst. of Indus. Engrs.: Wed., March 4, 7:30 p.m., Main Lobby, Airborne Inst. Labs., Commack Rd., Deer Park. Plant tour - electronics fab. facil. Ken Kessler, Evt. 2050.

Experimental Aircraft Assoc.: Fri., Feb. 27, 8 p.m., Wilson Technical Ctr., Dix Hills. Talk & demon. of epoxy glues. Spkr., Mr. Kassal, Duro Marine Prod. R. Rice, Ext. 1776.

Family Campers: Sun., March 1, 5 p.m., Plant 18, bus. meeting & refresh. Grumman's new camping van on display before meeting. Phil Giacini, Ext. 247.

Flying Club: Fri., March 6, 5 p.m., Plant 28 Auditorium, Meeting. Reg. for pvt. pilots ground school Feb. 24, Tues., 5 p.m., Plant 39. Carl Echols, Ext. 6101.

Soc. of Aero. Mat'l. & Process Engrs. (SAMPE): Tues., March 10, 5:30 p.m., Kings Grant Inn, Exit 46, LIE. Spkr., Charles Weizenecker, on "Critical Mat'l. Application for LM." Caren Carlson, Ext. 2725.

Soc. of Mfg. Engrs. (formerly ASTME): Sat., March 21, 7 p.m. cocktails, 8 p.m. dinner, House of Jericho. Ann. Install. Dinner Dance, $12.50/person. Guest spkr. Vincent Oliva, Ext. 84013.

Ski Club: Wed., March 4. Reg. meeting. Bill Brennan, Ext. 3451.

Stamp Club (Bethpage): First 3 Wednesdays of ea. month, 5 p.m., Plant 30 Cafeteria. Swapping, circ. book sales, auctions. Harold Haug, Ext. 3473.

Stamp Club (Peconic): Wed., March 4, 12 p.m., Plant 6 Conf. Rm. Swap. F. Franklin, Ext. 384.

Dealing in futures — Spiess' team tries to give the customer what he really needs

Eyeing future. Newt Spiess (C), who's directing the efforts of the Product Development Department, confers with Fritz Dunmire (L), director of Operations and Plans, and Jack Saxe, deputy to Spiess, on the five-pronged tasks that lead from original idea to a marketable—and profitable—new product. (Photo by Bob Settles)

Newt Spiess is a tall, burly man, a man no doubt capable of shouldering the new burden of directing the fortunes of the Product Development Department.

It's a five-spoked wheel that he'll be rolling, one made up of Operations Analysis, Advanced Development, Advanced Aircraft Systems, Space Advanced Systems, and New Product Lines.

"If you look at the function of our department," Newt says, "it's to manage an over-all effort to get new business into the house. That means that we'll have close ties with our Corporate salesmen, Business Development.

"To **manage** is the right word, too, because we're a relatively small group. We don't pretend to have all the 'smarts' necessary to perform the job. Far from it. Every one of us is fully aware that we're going to have to draw on the talents, skills, and resources of every part of the Company in order to succeed."

Newt's people have to handle the futuristic ball, and it's a big (and by nature, loosely defined) one that could rove across every "playing court" in Grumman, and on courts not yet even in the mind's eye. Seem wild, untamed, soaring? Yes, in a sense it is. But there's another aspect of it, one laden with constraints to keep the ball "in bounds:" money, facilities, and human resources.

"Sure, we're looking to the future and exploring fields that, for the most part, Grumman has not been in—and we'll look at a couple of them in a minute or two—but we can't fly off in lots of different directions hoping that we'll stumble upon a bonanza, We're going to have to marshal our forces in an organized way, looking, weighing, analyzing, determining priorities—making maximum use of the creative minds we have here. Believe me, we have lots of creative people, and we need every last one of them."

In short, the talent's here. The question is, How best to guide and direct the effort?

The five basic units under Newt's supervision provide the skeletal answer.

"For convenience, let's start with Operations Analysis, a logical spot for new ideas to bud. That's Dan Lynch's domain and the largest single group in the department. Ideas are their bread and butter. They're looking to the next generation, asking the big question: What will our present and future customers need? What will the nation need? What will society need?

No lack of ideas

"The problem there is never going to be a lack of ideas; they'll come pouring in like the waters of Niagara Falls! The real poser will be selecting good ideas that we in Grumman want to handle and can handle profitably."

Proposal activity from Concept Formulation to Development and Production leads to Bill Tebo's area, Advanced Aircraft Systems, or to Don Imgram's tent, Space Advanced Systems, or to Al Munier's bailiwick, New Product Lines. It's there that reliance is placed on a top-notch project team, one that might draw from every skill and department throughout Grumman.

All of these proposal efforts have to be supported by a broad technology base in which Grumman is just a little bit better than the competition. Frequently the development work that makes the difference between winning and losing a competition was started years before the proposal submittal date. Bob Bower and his Advanced Development people are responsible for keeping us in the lead in this area. Again the ideas that support his programs come from every part of the Company; boron, from Materials and Processing; electron-beam welding from Manufacturing; aero and propulsion improvements from Product Engineering; and advanced flight test techniques from Flight Acceptance, are typical examples.

Exploring new fields

"That future job, as I mentioned before, could be in almost any product line or service, regardless of whether we've done work in it before. We're looking to our social responsibilities, asking where the Corporation can help make a better world to live in. For example, we may explore the environment broadly, and find that we can contribute to programs that will help control air and water pollution. We could, with our space experience, get into a branch of medical equipment engineering—such as designing and building a system to allow human organ transplants to be transportable and maintained for a period of time. And of course, Grumman is already in a rather new venture—that of putting military-type sensor equipment into a Gulfstream I where it will serve earth resources research programs. For example, a magnetometer for the detection of changes in the earth's magnetism may help discover new mineral resources in Alaska," says Spiess. This ties in well with the Company's determination to make a broader-based product line.

Growth versions of well-established products form a major part of the Product Development effort. We are in a particularly strong position in having a broad product line such as the Navy's best attack plane, the A-6A Intruder; the coming F-14 air superiority fighter (and probably a reconnaissance version as well); the E-2A, the finest airborne early-warning system; the Mohawks—OV-1A, B, C, and D; and the EA-6B, the world's best electronic countermeasures aircraft system. And this by no means exhausts the list.

"Even in these days, when budgets have been cut all along the line and funds are scarce, there's action. Maybe—**maybe**—the F-14 is the last of the real big ones for one or two years, but there are many smaller contracts that can keep the plants humming. Every one helps. And who knows? One or two of these 'little ones' could be the spark for great things. Think back just a few years and ask yourself honestly: How many of us believed we'd be in the space business—and in such a big way?"

It is the special task of Spiess' organization to spearhead just such big ones (as well as smaller ones) for the future. He reflects, "One thing for sure, the future can be as bright as the past 40 years. If we continue to provide what the customer really needs, and do it better and cheaper than the next guy, our future is assured."

Solar sights

Hank Courten, an optical systems engineer in Product Support and a lecturer on astronomy at Dowling College in Oakdale, can't get away from that burning question, "Are there unknown comets revolving around our sun, inside the orbit of Mercury?" He thinks so, and on March 7 he hopes to prove it.

On that date a total eclipse of the sun will give him and his field expedition team (which includes Don Brown, Grumman metrology engineer) an opportunity to observe the comets. Courten has been on four other solar eclipse research expeditions—the latest to Siberia in 1968. It was during the Siberian trek and a Brazilian expedition in 1966 that he researched an existing theory predicting the existence of undiscovered, small bright comets orbiting very close to the surface of the sun. This week, in Southwest Mexico, he will have some cooperating observation teams spread out along the eclipse path to try to confirm his findings.

Dowling is sending Courten's team to a site near Puerto Angel, Mexico, where the total eclipse path begins. Long Islanders will be able to see a partial eclipse.

Yearning to learn?

The itch to learn more, for whatever reason—to get a degree, to get a better job, to learn for its own sake—can be gratified in many ways. Some of them might be found in the non-credit courses being offered at C. W. Post College.

Offerings range from speed reading to advertising to Afro-American history or psychology or extrasensory perception. There are 61 possibilities in all. Course fees range from $20 to $100.

For information call Nancy Weinberg, 299-2334.

A talk with Clint Towl:

'The greatest thrill in life is . . . tomorrow'

Could there be a stranger contrast than the one Clint Towl remembers when he looks back 40 years to the founding of Grumman Aircraft Engineering Corporation? Then he was chief cleaner-upper of a run-down old plant. Today he is Chairman of the Board and Chief Executive Officer of Grumman Corporation and Chairman of all its subsidiaries.

He was the only one of the six founders who hadn't worked for Loening Aeronautical Engineering Corporation in New York. "I'm the only outsider," he says, "and I may say I worked two weeks longer than anyone else, including Roy Grumman. I went out there to Baldwin about the 15th of December, 1929, with Al Hill and Sandy McDonald, the carpenter. We were to get the new plant ready. Never saw such a mess in all my life! There weren't any skylights left in, glass was all broken, there were about four feet of oak leaves all over the floor! Oh, we finally got it together some way or other, and got going. . . . "

Such was the inauspicious beginning beside the Long Island Rail Road in the winter of 1929-30. It was wall-to-wall mess. But the rent was cheap, and the six young men—Roy Grumman, Jake Swirbul, Bill Schwendler, Ed Poor, Joe Stamm, and Clint Towl—were charged with enthusiasm for a new business venture, building floats for Navy aircraft and repairing amphibian planes.

Clint Towl's 40th anniversary reminiscences are full of color and contrast, humor, and a sense of history as he ranges from the depression years of the '30s to early World War II to the beginning of the space effort and prospects for the '70s. Listen in on a conversation that helps to explain a company that in 40 years grew from nothing to annual sales of $1.2 billion in 1969:

Q: What are some of the things that contributed to the Company's success?

ECT: I think the most interesting thing about this Company is the remarkable length of time a group of people, who were not great friends or anything else like that, have stayed together. You know you usually find somebody who thinks the grass is greener on the other side of the street and says, "Oh the hell with it," and leaves.

One of the things we always practiced, in the early years, anyway, was non-socialization. We never socialized together. For instance, I don't think I've been in Roy Grumman's house four times in 40 years, except to pick him up for a meeting or something like that. And it's true in reverse.

Q: Mr. Grumman and Mr. Swirbul were of completely different temperaments. Did they get along well?

ECT: Far from it. They were entirely different kinds of people. But they had a very remarkable agreement between themselves which isn't generally known. They agreed that they'd **never** go home at night with a difference of opinion as to where the Company was going. And there were some royal discussions which I heard, overheard, and was in on. But come in in the morning and ask the two of them, at opposite ends of the plant, the same question, and you'd get exactly the same answer!

Q: How did the Company manage to survive the depression? When you started in 1930, did you realize how the depression was going to go?

ECT: No, it hadn't taken any serious effect except, of course, that the stock market had fallen off in October 1929. A lot of people thought it had hit bottom in the spring of 1930, but it hadn't, by far. The real unemployment didn't start till later on; '31 was **real** bad.

Q: Were there times in the '30s when you thought perhaps you weren't going to "make it"?

ECT: Well, in the summer when we were still in Baldwin, Ed Poor and I alternated working. We weren't paid for the weeks we didn't work, to cut down on everything. And we closed the plant for two weeks in the spring of '32, when we were in Valley Stream.

But we have always made money ever year we've been in business. Every singl year. We've paid a dividend every year. Th first two, we paid a dividend on the pre ferred stock only. That was redeemed i the third year, and starting at that time, th Company always paid a dividend on the com mon stock—since '32. I have the first audite statement of the Company. I've always kep that. We didn't have very much money. Kid dingly, we used to say it took a Board o Directors meeting in order to buy an electri drill. And it pretty nearly did.

Q: You were the first paymaster?

ECT: I guess so. I was the first of a lot o things. I was the first inspector, first pay master, first mail boy, first janitor.

Speaking of pay . . . Perhaps you remem ber the "bank holiday," in March of '33. Al the banks closed, and that meant we couldn' get money for our payroll. Of course th Company was paid by Treasury checks an theoretically the Treasury never closed, s we actually took some of our checks—som of the Company's checks—and went to th U.S. Treasury in Washington and cashed ther and got on the train and came up here. W never missed a payroll. I will admit we ha a little difficulty making change—but we cam as close as we could. But we did pay ou people.

And you might be interested in the averag rate of pay. In 1930 it was 35 cents an hou on the manufacturing floor. The highest pai person got 50 cents an hour.

I can remember one time when Roy wa sitting at his desk and Jake was across fron him, and Roy said, "I never want to see thi Company get any bigger than 250 people Because when it does, we're going to los control of it in getting the job done." And said, "Roy, I'm sorry. It's too late. We've gc 261 right now!" That was in mid-1934, an from there on, it took off.

Q: Part of the Grumman "tradition" is th Christmas bonus. When did that start?

ECT: We always paid a bonus every year. It wasn't calculated the way it is now—just a nominal amount: $25 the first year for everybody—it was a lot of money then. That was over a week's salary for **me.**

In 1930 we were just finishing the first float contract around Christmas time (we didn't have many employees) and Roy and Jake—well, I believe it was out of their own pockets—went across the street to the meat market and bought turkeys for everybody. They used to give out the turkeys in their offices and then the Company got so large that it was just impossible. It was the start of a long, unbroken tradition.

Q: What kind of a man was Jake Swirbul?

ECT: He was a remarkable person—and he was "Jake" to everybody. He had a remarkable sense of, oh, human relations, how to handle, how to treat people. He was probably the best teacher I could ever have had along that line. He was a salesman. And a winner: he couldn't bear to lose. During the war he was over here practically the entire time, nights and days and everything else.

When he went to Washington he'd never take anybody with him. Didn't want to. That was his business: it was all right. There came a time in 1959 when I knew he had a date in Washington the next day, with the Under Secretary, I think it was. I went into his office and said, "Jake, how about taking me along with you? It's just in the event that you don't feel like going to the follow-on meeting, someone here will know what we discussed."

"No, it's all right. I'll go." Fine.

That night about 11 o'clock (I was in bed) the phone rang and it was Jake. He said, "I can't make it. Will you go to Washington? Tomorrow morning. Nine o'clock." I said, "Sure. What's the subject?" "Come on over to the house," he said.

So I got up and dressed and went over there. We chatted a couple of hours and I went to Washington. (I took George Titterton with me, because he was more knowledgeable about what we were going to talk about.)

Today, we always take someone with us, because we're all human and anything can happen.

Q: It might be interesting to see how Grumman progressed in developing its facilities.

ECT: Plant 1, which we built in 1936-37, was our own. Plant 2 was built under an Emergency Plant Facilities contract, where the Government built plants during World War II. I wrote the contract for the Navy which became the standard form—the first one that ever existed. I was down there one day and they wanted to build Plant 2. The Navy had never had such a contract before—it had just been authorized by Congress. I was seeing the Chief of the Bureau (of Aeronautics)—I think it was Dick Richardson—and I said, "What are you going to do?" and he said, "I don't know, but here's a desk. Would you mind drafting one for us?" So I said, "Sure, but I'm not a lawyer; you know that. But at least we can get down the facts of life," which we did, and they used it. Of course, the lawyers found out that a poor old layman had drawn it, so of course that was "no good." But it worked.

Plant 2 was built by Austin. At the time the Government didn't have many fancy rules and regulations, and our only inspection, for approval, was **after** the plant was built. It took about two hours and a couple of guys walking through and saying, "That's fine."

And then we started to build additional plants: 3 (that was the front part—it was built in two sections). We had some engineering supervision on the plants. I wish I could remember all the prices per square foot, because it's really quite fantastic. I think Plant 2 was about $2.85 per square foot, complete with parking field and a fence around it, and light, heat, and power . . . And Plant 3 was about $3.50 a square foot. And the last plant we built during World War II, which was the original Plant 5, was $10 a square foot.

I think Plant 2 was finished in July of 1941. We were having Open House on December 7. Had a whole mob of people in that place—kids, wives—and I got the word of what had happened at Pearl Harbor, and I thought, "Oh, brother, I can see a panic." We didn't have a great number of guards there—didn't have the security we have today, by a long shot.

"We were having Open House on December 7 . . . and I got the word of what had happened at Pearl Harbor . . ."

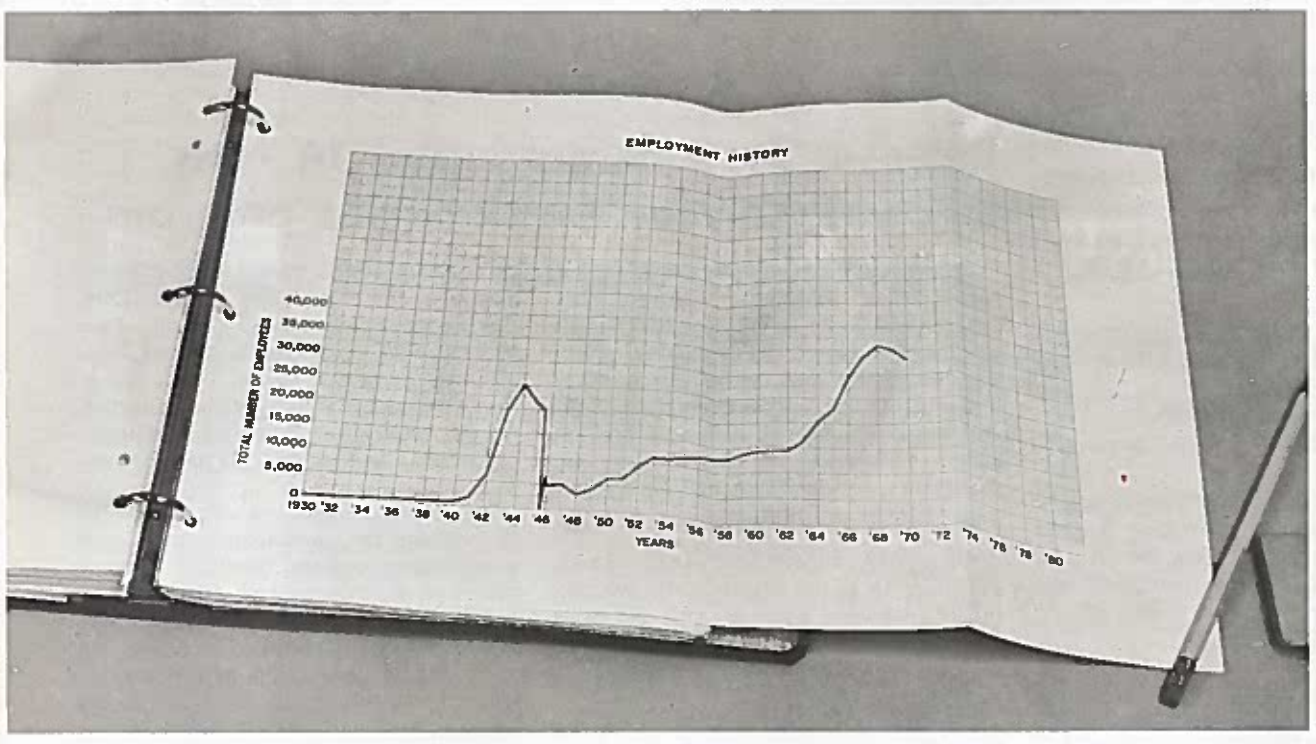
I got the maintenance people and the guards and we immediately "ran out" of food and we "ran out" of ice cream and soft drinks. We just took them away, because people lose interest pretty quickly, especially with the kids. I thought, "If we can only get them going towards the door . . ." because no one there knew yet what had happened. We finally got all the people out before the story broke. I don't think anyone in the plant knew it, outside of a few of us in the Company. And we locked the door. . . .

Q: How did **you** hear about it?

ECT: Tell you who I think it was: a fellow by the name of Reilly—Sam Reilly. He was running the PA systems and he had a radio sitting up there and that's how he heard it, and he came down and told me about it.

So we got everyone out and locked the

(Continued on page 6)



Charting history.
Among Clint Towl's souvenirs are many old records of Company progress dating back to first year of operation. This composite record shows ups and downs of employment, with high (so far) occurring in 1968. The low point was on V-J Day in 1945 when everyone was terminated, for a few minutes to a few days or more, till the Company could re-group for peacetime production.

A talk with Clint Towl

(Continued from page 5)

doors and then we had to go through the whole plant, because you suspected anything —sabotage—there were all kinds of stories. I crawled through every damn air conditioning center, the rooms where the fans were. (Wonderful places to hide.)

Next day there were stories of airplane attacks on the Atlantic Coast and all sorts of things. Nothing ever came of it. I don't think we ever had any act of sabotage at all.

Q: Was it a great decision to make when you built Plant 25? It was contracted for before we got the LM contract, wasn't it?

ECT: Yes, we had to have Plant 25 in order to win LM; it was a prerequisite. We took a gamble. We'd never been in the space business, and I told the boys at that time that I'd be willing to gamble the profit on the contract for facilities necessary to perform that contract, in order to get us into that kind of business.

Q: Could you explain that a bit?

ECT: To put it simply: If the profit calculated on the contract was $5 million, I would be willing to spend $5 million on additional facilities in order to get us into that area, which we'd never been in before. And it's surprising how close it came out. (The profit was a lot more than $5 million.)

Q: Would you venture a forecast of what you see for the future? Do you do a lot of looking into the future?

ECT: Always do, always do. I think that the greatest thrill in life, frankly, is—tomorrow. Where you're going, what you want to do. Today you've had it.

No, I think there's a wonderful future for the younger people around here, and I hope we can help to train them, lead them, whatever you want to call it.

It's probably been the hardest job of my life sitting here as Chairman of the Board **not** to make decisions for people. It's a tough, tough job.

You've seen us sort of split things up a little bit here, with these individual companies. Put them on their own feet. Grumman Data Systems, for example. It's very interesting to sit in that Directors' meeting, because everybody that's running that company is now fortyish, or younger. How wonderful that they have to go ahead with that. Well, they very rightfully want to do it themselves. If it doesn't work—they have to stand on their own feet.

You've heard a little bit about Ecology—I call it Earth Resources, the preservation of resources. I think there are a great number of things that have to be done here in this world in order to feed the human race or to prevent the human race from destroying itself through pollution.

You saw that we took a Gulfstream I and re-equipped it with some instrumentation that we had. We've even used it in other airplanes. It's not generally known in the commercial field, and we're going to see if we can't sell our services there. I think we can.

There are some other things in the future I obviously can't talk about. But some of these are very interesting.

When we went into the LM Program, that was a **very big step** so far as this Company was concerned, because up to that time we were pretty well restricted to military aircraft. Yes, we had built Gulfstream I at that time, but it was pretty limited, compared to what we're trying to do today.

We've had an eventful 40 years and I've enjoyed every minute of it. Perfectly frankly, I don't think anybody that I know of has been as lucky as I have, having as much fun in a lifetime.

Clint Towl was elected Assistant Treasurer of Grumman Aircraft Engineering Corporation in 1937, Vice President and Assistant Corporate Secretary in 1940, Administrative Vice President in 1954.

In 1960, on the death of President L. A. (Jake) Swirbul, he was elected President, a post he held until 1966, when Roy Grumman retired as Chairman of the Board. Clint Towl then became Chairman of the Board of Directors and Chief Executive Officer of Grumman Aircraft Engineering Corporation.

In May of '69, when the Company was reorganized, he became Chairman of the Board and Chief Executive Officer of Grumman Corporation, and Chairman of the Board of each of its subsidiaries: Grumman Aerospace, Grumman Allied, Grumman International, and Grumman Data Systems.

(Photos by Nat Scherer)

OBITUARIES

Plane News has received word that death has come to the Grumman personnel listed below. We extend sincere sympathy to relatives and friends.

EUGENE CORDEIRO of Shipping & Spares Consolidation, Plant 17, died February 9 at the age of 63. He had been with Grumman since 1948, and he lived at 1509 Berkeley Ave., Baldwin.

JOSEPH CACAMIS, who had completed 28 years with the Company, died February 13 at the age of 48. He worked in Manufacturing Planning & Control Management, Plant 2, and lived at 22 Ferney St., Hicksville.

JOSEPH L. CROCKETT of LM Procurement, Plant 25, died February 14 at the age of 49. He had been with the Company nearly 11 years and he lived at 23 Camelot La., St. James.

LOUIS B. SIGAFOOS JR. of Sub-Assembly, Plant 77, Stuart, Fla., died February 16. He was 39 years old and had been with Grumman five years. He lived at 199 Melba Dr., Jensen Beach, Fla.

DEWEY A. LOVELL of Fuselage Joining, Plant 55, Savannah, Ga., died February 16 at the age of 44. He had been with Grumman since 1963. His home was at 218 E. 56 St., Savannah.

JOHN J. ORMSTON JR. died February 16 at the age of 60. He had worked in P/S Product Verification & Support, Plant 6, and had been with Grumman since 1966. He lived on Sound Beach Blvd. in Sound Beach.

JOHN P. SCHAUDEL died February 17, age 61. He had been with the Company 14 years, and he worked in Instrumentation System Design, Plant 6. He lived at 119 McGaw Ave., Centereach.

WILLIAM LIMPEROPULOS died February 19 at the age of 54. He worked in Food Service, Plant 30, and had been with Grumman 19 years. His home was at 281 Lincoln St., Franklin Square.

RICHARD E. SALVANTE of Intra-Plant Transportation, Plant 2, died February 23 at 58 years of age. He had been with Grumman 12 years and lived at 12 Woodland Ave., Holtsville.

Business Systems graduates 14 men following 2-year development program

The newest of Grumman's Professional Development programs, Business Systems Professional Development (BSPD), has just "graduated" its first group. Having completed two years of working assignments in four different areas of the Company, the 14 members are assigned to permanent posts where the experience and training they have gained can strengthen their chosen departments. Group I included Robert Allen, Thomas Brunner, Joseph Cerruto, John Giunta, Herbert Goldstein, Ronald Hannington, Frederick Knief, Craig Langwost, William Marson, Edward Roemer, Robert Schiffer, Raymond Tallman, Frederick Treubig, and Michael Tricarico.

The stated objectives of BSPD are "to broaden the participant's knowledge of corporate business, financial, and administrative systems and operatons; to accelerate the development of the participant's career potential; to insure the continuity of leadership at the professional level through preparation of selected individuals for greater responsibility."

Group II is half way through the program, and Group III is just beginning.

Flader wings far above average to reach 673 in Red pin picking

Getting top billing in Grumman's bowling frolics is a flick of fate that may be best described as something like that old radio talent show tagline of "Round and round it goes, where it stops, nobody knows!" This time, the wheel of fortune touched on Hans Flader of Computing Services, Plant 5, a 174-average pin hitter in the Red league. Flader pumped his way into the spotlight for the first time this season, but he had to soar 151 pins over his usual delivery. Buoyed by a 254 in the middle box, Flader danced to a 673 series, best performance on this week's report. Earlier, the Red watched Stan Domagala roll 255 and John Cabbe put together a 638 series, with Jim Boyd rolling 622 and Frank Mladinich 602, while sprinkled over the action were 230 games by Boyd, Tony Giancola, and Marty Popp. . . . Bill Diercks, a solid thrower from Syosset Mixed, was well up the scoring ladder as he socked 258 to crack John Betterino's loop record by 10 sticks, and then go to a 658 tally. Betterino rolled 247-617 and Jim Barnette 242. Betterino is now carrying a 196 average—which is heavy haulage. The girls' laurels were pinned on Marilyn Bunzel for 199-524. . . . Lunar lights flashed on Hank Zembko as he pulled the switch on both league records by firing a 255 game and 624 string. . . . Cliff Hartnack, now third in the individual standings behind Jack Nielsen and Joe Wilson, shot a 267 game in an 845 four-game series in the Masters feature, but lost the match to Stan Zolek, 3-1. Zolek shot 829, but started the duel with 236 and 220. Mike Greggo added to the furors with an 806, while Grover Hart kegled 237. Earlier in the Masters, Al Duspiva led the parade with a booming 253-810, while Ken Gutekunst hit 237 and Mike Izzi 235.

Petruchia pegs 252-641 for Classified crest

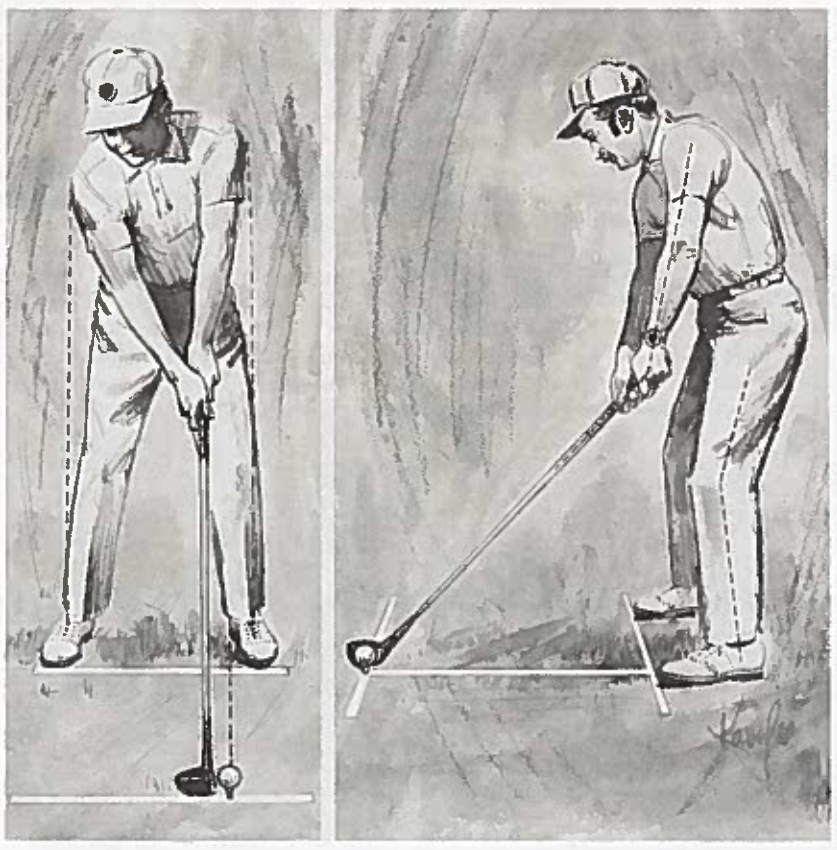
Known as the "home of the 300" since Bob Ruotolo's spectacular feat several weeks ago, the Classified loop got a sharp shot this time from Fred Petruchia's 252-641, with Bruce Saidler rolling 233-607 and Charlie Catalano clipping off a 602. . . . Dick Dickerson swept up the honors in the Aerospace circuit with a 248 game and 600 series, and he did it for the first-place Doof's. Jerry Pless hit 225 and Tony Missale 231, while Bud Groeber pulled down honors in one round on 591. . . . Rudy Dunkley, always on or near the top in Nite Owl throwing, paced the parade this time with 232-635, while Harry Haase rolled 236 and Len Scaturro 224. . . . Joan Burgess' 215 and a 212 by Virginia Geer took the play away from the men in the Patchogue Mixed. Joan rolled a smooth 577, while in one of those sport oddities, Gene Burgess rolled two 582 series in a row. In a previous round he was only two sticks off this pace. . . . Chet Everoski threw 236 and Tony Klobukowski a 612 series in the Hawkeye Mixed, while earlier Tom Cava's 234 and a sturdy 633 by Bob Sparrow were highs on the honor roll. Cava finished with 626 and Bill Jacobsen snatched a share of the bouquets with 612. Nikki Delaney's 202 and 494 by Barbara Marks were the distaff delights after Fran Zuk had swept honors previously with 180-492.

Wright is right with mighty 254 Trader toss

Tom Wright picked himself up a bowling trinket in the Trader League with a 254 game, while Frank Nelson bumped the pins for a 626 series after rolling 247. Jim Rose also jumped into the "600 club" with four pins to spare, while in earlier action Jim Stapleton was king of the hill on 216-611. High on the list was John Stecker's 230. . . . John Lofano brightened the Black circuit with a 627 featured by 220 and 216 games, while Willis Growvogel shot 238. . . . Vinny Mirabella's 234-612, and 222-602 by Jack Juppe, were highlights in the Woodbury Mixed. Doris Dietz, Georgina Nurnberger, and Marie Prochaska led the ladies. . . . George Reuther and Augie Oppedisano both clicked off 221's in F-111 play, while Reuther's 596 was high total. . . . John Perkowski rolled 234 and Lou Truppia vaulted to a 615 series in Bearcat battering. . . . June Becher took the play away from the boys in Monday's Mixed with a 212 game. Best for the fellas was Jerry Kelly's 206, and he also had high series of 584. Jean Maresca's 520 was high girls' series. . . . Tom Smith blossomed out as the Brown league pacesetter on 213-576.

Golf guides

Address adds to the zip



This series of golf hints is being offered by Mike Cherry of the GAA, who is a member of the Professional Golfers Association (PGA). Illustrations are by Craig Kavafes of Presentations Services.

1. Your position at impact should be similar to the one you take at the start of the backswing, so it is important that you are in the correct position before any action takes place. You must be properly set to get a good start toward a successful shot—there must be no tension or muscle strain, and you must be ready to move with ease in either direction. Stance gives you balance, so stand fairly erect, spread your feet about the same width as your shoulders, with the left foot turned slightly toward the hole. Using the basic square stance, place your feet so that an imaginary line across the toes would be parallel to the intended line of flight. Your weight should be evenly distributed on both feet, and carried on each foot from the ball through the heel of the foot.

2. Avoid reaching; let the arms fall naturally, with the left shoulder slightly higher than the right, and with a slight break at the hands. The ball should be played on a line off the left heel, with the club head resting gently on the ground and parallel to the feet. The head should be kept cocked slightly to the right, with the left eye on the ball. Keep both knees flexed so that it is easier to move them toward one another during the swing. The correct position at address should give you a firm foundation, and should give you the feel of free movement in your shoulders, hips, and arms. The proper address gives you good balance and freedom of movement—and when combined with a good grip, will enable you to make sure shots.

Gophers stack trophy collection

Grumman's Gophers have a shiny collection of hardware from the Cos Cob (Conn.) rifle tournament to display as evidence of their firepower.

Six shooters from Grumman walked off with medals in the annual Nutmeg State classic, and their collections provided some consolation for a South Shore League team loss to the Roslyn Rifle & Revolver Club, the defending champion.

Henry Shoten of Engineering, Plant 1, made the best Grumman showing at Cos Cob, winning first place, prone, in the Marksman class. George Hilton of Materials, Plant 12, won a second-place medal, sitting, in the top-rated Masters class. Hank Womble, Engineering, Plant 15, was fourth standing, in the Masters. Three Grumman riflemen collected prizes in the Expert class: Bob Lang of Transportation was second in the sitting position, with Joe Anckner of Gulfstream, third; Al Burns of Manufacturing, Plant 3, was third in the kneeling position.

The Gophers, in trailing Roslyn, 980-959, were handed their first defeat of the season despite an excellent 197 posted by the veteran Dick Imgram. Womble shot 193 for Grumman, Joe Moks 189, and Anckner and Burns both posted 190's.

Grumman now holds a 6-1 record in the South Shore loop, with Roslyn unbeaten in seven matches. The Gophers are unbeaten in the L.I. Industrial League.

Transportation in high gear

Transportation has come on strong in the Tuesday night basketball league at Bethpage by putting the brakes on the New Comers' drive to the title and setting up the possibility of a three-way tie for first place.

After losing two early-season games, Transportation has raced to six straight victories. One recent performance, a smoldering 77-75 win over the New Comers, was decided by late foul shots from John Green and Jim Cruthers. Brian Berke netted 25 for the Road Runners, but Cruthers was high with 27. Later, Transportation racked up a 95-64 win over the Hustlers as Berke exploded for 36 points.

These victories pushed Transportation into a 6-2 mark, with the New Comers still in front at 6-1. The Collegians are a threat with five wins and two defeats.

In the Collegians latest victory, they reached the high point production of the season by walloping the Hustlers, 124-82. Gary Pike bombed the nets for 34 tallies, outdueling the Hustlers' Hambrecht, who finished with 29.

Cold Flow broke the ice in the Wednesday circuit, clicking for an 82-57 decision over the Rejects as Pat Garahan poured in 33, and Jim Litterelle 21.

Grumman draws against 15 in Swirbul Trophy shootout

The granddaddy of all Long Island bowling classics will be as sprightly as ever this year when the 29th annual L. I. Industrial tourney wheels into action Saturday night, March 7, at Mid Isle Lanes, Hempstead.

Action will be fast and frisky as 16 high-geared teams toe the foul lines again, shooting for the Swirbul Trophy and team championship won last year by Sperry. Aligned against the defenders will be Airborne Instruments, AMF, Arma, Doubleday, Fairchild Camera, Stratos, Kollsman, LILCO, L. I. Water, Newsday, Pan American, Reeves Instrument, REF, Republic (Fairchild-Hiller), and the host team, Grumman.

These five-man teams will shoot a total of 12 games spread over four rounds, with total wood deciding the championship. Play is scheduled March 7, 14, 21, and 28.

Grumman's starting combination, based on the results of a 27-game tryout tournament, will consist of Johnny Alston, Vin Crevoiserat, Ben Plawski, Ken Gutekunst, and Jack Nielsen. In reserve will be Ed Hilbert, Walt Matuza, Mike Greggo, Mike Internicola, and Grover Hart. Grumman looks strong enough to win, but tough competition has been coming in recent years from Sperry and LILCO.

Grumman has won the tourney 14 times in 28 years, and took the Swirbul Trophy six times in a row, 1960-65, before its reign was broken by Sperry in 1966. Grumman finished fifth in 1969.

Besides the Swirbul Trophy that is awarded to the scratch champion, trophies are also awarded for the high individual game, high individual 12-game total, and to the team bowling the most pins above its entering average. That last award is called the Incentive Trophy, won last year by Fairchild Camera.

The Industrial competition has always been high-calibre, as the records indicate. The all-time marks include a 300 game by Bill Helstrom of Republic in 1950, and a tremendous performance by Herb Player of Liberty in 1952 when he rolled up a three-game series of 793 and totalled 2705 for the 12 games.

Republic holds the team game record of 1119 set in 1950, and the team series tally of 3167 shot the same year. The great Liberty teams, which won the first four tournaments starting in 1942, set the tournament total-pin record of 12057, shot in 1945.

The Industrial tourney has generated great spectator interest throughout its history, and Mid Isle offers grandstand seating for several hundred people. Mid Isle is on Peninsula Blvd., in Hempstead, and bowling starts each night of the tournament at 8 p.m.

Grumman was matched against defending Sperry in the opening round.

Frey No. 1 in women's pin trials; Ritz hits 234 in tourney finale

Norma Frey of Plant 6, Calverton, will lead the Grumman varsity team in defense of the L.I. Women's Industrial bowling title when the annual attraction gets underway on Saturday, April 11.

Averaging 182-plus over the 18-game route, Norma won the qualifying honors with a pinfall of 3281, leading Sandy Ritz of Plant 39 by 93 sticks, with the veteran Chin Thompson of Plant 25 finishing third at 3120. Making up the starting five, selected on the basis of total pins in the trials, will be Lynn Sowers of Plant 35 and Bertha Siegl of Plant 38.

Frey faded somewhat in the final round with a 474 series, but in the previous session had bolstered her lead with a 540 string against Ritz's 512. Ritz, however, rolled a 566 in the finale, and featured play with a sparkling 234 in the last game, after having started the string with 134.

The Women's Industrial event will be held at Mid Isle Lanes, Hempstead.

Final standings:

Norma Frey	3281	Dot Jacobsen	2882
Sandy Ritz	3188	Donna Lawrow	2868
Chin Thompson	3120	Meg Sheridan	2797
Lynn Sowers	3019	Ruth Carr	2755
Bertha Siegl	2934	Louise Segar	2721

Berka, Oliveri pace shooters

Two sharpshooting members of the Grumman Plant Protection force are boosting the fortunes of pistol teams sponsored by the Rod & Gun Club in both L.I. Industrial and South Shore leagues.

Guard Al Berka and Lt. Joe Oliveri paced two important victories for Grumman in recent matches, and both have a shot at individual honors in the two circuits, as does Fred Wicks of the Grumman Hawkeyes.

Berka fired 287 and Oliveri 277 as the Trackers continued their strong push for the Industrial title in the Expert division with a 1070-1029 win over Pan Am. Art McKee added 256 and Roger Seybel 250.

Berka and Oliveri were again in the starring roles as the Center Fire team defeated the Buckskins by 1034-915 in the South Shore circuit. The Buckskins, who won the 1969 title, were beaten by Grumman for the second time this year as Berka shot 277 and Oliveri 250. Ed Moles and Greg Criscione figured in the win with 251 and 236, respectively.

Wicks excelled with 281 as the Hawkeyes beat the Trailers, 1034-885, in an all-Grumman Industrial match. Moles posted 257, Warren Strittmatter 254, and Henry Shoten 242 for the Hawkeyes, while Bernie Boyle was high for the Trailers at 244.

The Grumman Gulfstreams outscored Indian Head, 966-954, in the Industrial Sharpshooter bracket, with Herb Wolter firing 254, John Crawford, 246, Bob Bergman, 237, and Bill Peterson, 229.

In the remaining match, Expert division, the Mohawks trailed Sperry, 1065-1036. Howell Fesq and Nick Evangelides both shot 260 for Grumman, with Ron Trenkner at 259 and Charley Nauss, 257.

High Cliff

A late flash from the Masters League bowling at Woodbury credited Cliff Hartnack of Plant 29 with a new series record of 905 for four games. Hartnack shot 255, 234, 235, and 181 while blanking Mike Greggo in the individual competition. He won the finale by only 10 sticks when he missed four spares. The former Masters record, 865, was held by Johnny Alston. Hartnack also holds the league game mark of 268.

Pin prize. Coveted championship award in the L.I. Industrial bowling classic is the Swirbul Trophy, being admired here by Carol Smith (L) and Marilyn Cottone of Plant 5. This silver souvenir will be the target of 16 teams in the 29th annual tourney starting March 7, at Mid Isle Lanes. (Photo by Nat Scherer)

Jenkins rolls into Nite Owl tryout lead

A booming 627 series carried Ernie Jenkins of Plant 1 into the third round lead during the Nite Owls varsity bowling tryouts at Mid Isle Lanes, Hempstead. Jenkins finished off his series with a 243 game, enabling him to hurtle past Alex Klimenko and gain a 44-pin cushion. Jenkins totalled 1780 for the first nine games.

Klimenko yielded the lead by rolling only 523 after he had knocked down 616 sticks in the second round. He has a 1736 tally and is only three pins in front of Judge Locke of Plant 1. Locke rolled 591 in the third round and featured action with a 254 game. Marty Susa, ranking 10th, bowled 240 and John Santangelo hit 233. Top game in the second round was Harry Haase's 236.

The top 10:

Ernie Jenkins	1780	John Santangelo	1613
Alex Klimenko	1736	Edwin Martin	1588
Judge Locke	1733	Thomas Iovine	1576
Ray Beauchesne	1695	Ralph Laurino	1570
Rudy Dunkley	1618	Marty Susa	1558